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A REVIEW.....

Scientific artificial insemination in swine

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Artificial insemination (A.I.) is the process by which semen is deposited in the female reproductive tract during fertile period by means of an instrument to obtain pregnancy. Artificial insemination was first done by Lazarro Spallanzani, physiologist, in the dog (Perry, 1948). The swine industry contributes about 8 per cent of the total meat in India and Uttar Pradesh is first in the swine meat production (BAHS, 2012). Artificial insemination in pigs has been used since the early 1930s but its true development and wide commercial application in the pig industry take place in 1980s. In some European countries, such as Belgium, Italy, Netherlands, Norway and Spain, more than 80 per cent of the females are bred by Artificial insemination and in North America (USA, Canada and Mexico) and Brazil the percentage has already reached 75 per cent in large farm units. In India swine production sector is in his growing stage. The swine industry is well established in the north east part of India. This sector may play an important role for the improving the economic status of the farmers. It requires less input and more benefit due to higher growth rate and high feed conversion efficiency. Scientific techniques of Artificial insemination are essential for economic benefits and sustainable growth for swine industry in the developing Indian condition.

Advantages and disadvantage of Artificial insemination :

Maximum utilization of sire is possible due to use of Artificial insemination methods. Allows for widespread use of superior genetics and allow use of heavy boars on light females. Larger sanitary control and hygienic cares and increased control of breeding programs in the farm. Reproductive performance can be equal or superior to that obtained with the use of the natural mating. There are some disadvantages also due to the Artificial insemination in the swine production. Artificial insemination techniques causes increased level managemental practices. Adequate physical facilities are required for estrus detection and Artificial insemination It also responsible for spread of genetic abnormalities and many diseases. Artificial insemination practices

required trained person from semen collection to artificial insemination. However, the Artificial insemination practices are very important for the commercial pork production for maximum economic benefit.

Semen collection methods :

The semen collection from the pigs should be at the standard age. Generally the age of puberty in of gilts is 6-7 month and in boar 8 month. In gilts breeding age is 8-10 month and boar is used for regular breeding from 1.5-2 year of age. Boar should be trained when he is between 8 and 10 months of age. The first part of the ejaculate (pre-sperm) should be discarded and the sperm-rich fraction should be collected (40-100 ml). Immediately after collection, collection tube should be kept at a temperature of 35^0C-37^0C. Semen collection from boars in AI-centres should perform approximately 2 times per week. The corkscrew end of the penis is grasped with a bare or gloved hand. Semen is collected into a thermos. The grip on the penis should not be loosened during ejaculation, which on average requires 5 to 6 minutes. Artificial vagina (A.V.) method is also used in some part of the world. Optimum pressure must be provided during collection. Each dose should contain 2-3 billion spermatozoa in 80-100 ml.

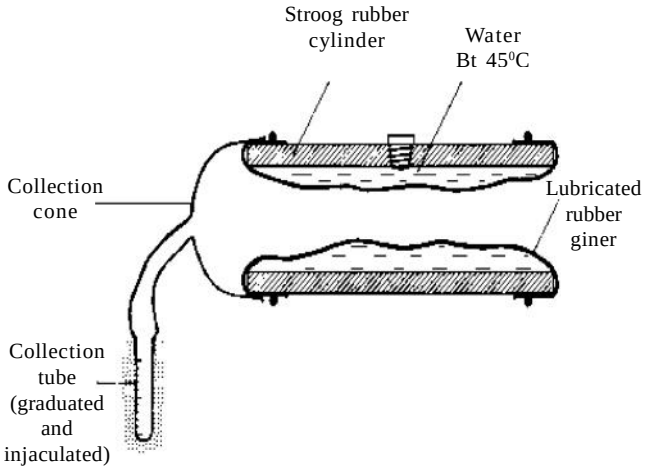

Fig. 1 : Artificial vagina for semen collection from boar

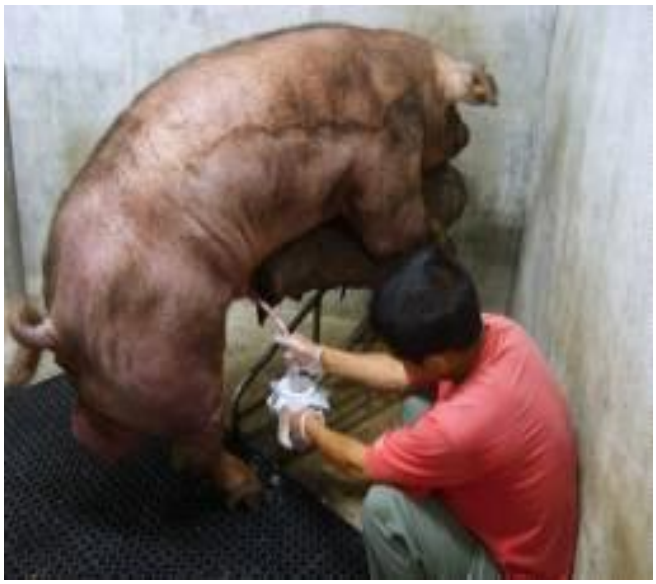

Fig. 2 : Semen collection process from boar

Evaluation of semen quality and its preservation :

Morphological study :

Automated sperm morphology analysis system (ASMA) is able to locate the head of the spermatozoa and compare its morphology to internal standards.

Macroscopic, microscopic, bacteriological, biochemical and physical tests :

It includes volume, colour, mass activity, individual activity, total sperm count, consistency and cloudiness, live and dead sperm count and morphological study osmotic pressure, specific gravity, electro conductivity.

Photometry is commonly used in practice because it is fast and easy to perform. Nucleocounters are used for determining sperm concentration, and they provide similar counts as those obtained with photometers.

Computer assisted semen analysis (*CASA*) :

The method is objective, independent of the interpretation of the technician and gives detailed information on the sperm movement.

Sperm quality analyzer (*SQA*) :

The SQA systems convert variations in optical density into electrical signals to determine sperm concentration and motility.

The use of sex-sorted and frozen-thawed sperm in artificial insemination is beneficiary for the farmers (Bathgate, 2008). Cryopreservation of boar semen enhances productivity and biosecurity measures (Bailey *et al.*, 2000). Many cryoprotective agents age available but the glycerol is the best than others (Watson, 1995). Different type of cryoprotectants are used in swine industry like In general the diluents are such as egg yolk

(Polge *et al*., 1970), EDTA (Milovanov *et al*., 1974), glucose egg yolk (Crabo and Einarsson, 1971), Tris-fructose EDTA egg yolk (Salamon and Visser, 1973) and EDTA egg yolk (Park *et al*., 1977) etc.

Heat detection in sow :

European breeds used in commercial pig production reach puberty in 194 to 328 days (Ito *et al*., 1944), Meishan boars of China at 75 days (Harayama *et al*.,1991) but in non-descript local male pigs reared in India is 3-4 month (Kumaresan *at el*., 2008). Period when sow stands still and rigid when we apply pressure on her loin. It is the optimum time for insemination. The normal heat period is 2-3 day in sow and 1 day in gilt. A pheromone identified as 5α-androsterone, produced by the boar testis is important for heat detection. Mounting by over other animal and allow other animal to mount over it. A peculiar grunting sound, restlessness enlargement, redning, swelling of vulva are the other important heat symptoms.

Thawing and insemination techniques :

Boar semen can successfully be frozen, thawed and used for AI (Grobfeld *et al*., 2008). Liquid preservation for the bore semen is maximum for 7 days (Weitze, 2000). Thawing has to be done in order to maintain sperm motility and acrosome integrity afterward. It should do just before insemination. The fertility with frozen semen results in a 75 per cent furrowing rate and a litter size of 9.6 (Roca *et al.,* 2003).

A minimum of 80-100 ml liquid semen are necessary for the Artificial insemination in the swine (Baker *et al.*, 1968; Wiggins *et al.,* 1951 and Stratman and Self, 1968) but in case of packages straws a 5ml straw are widely used (Almlid and Hofmo, 1996 and Westendorf *et al*., 1975). Different equipments should used for clean and successful Artificial insemination like rubber apron, non-spermicidal lubricant, disposable vinyl gloves, catheter, semen bottles and tubes . Sterilization-boiling in water for 10-20 minute. Autoclave-rubber wears and A.V. are autoclaved in 10 lbs pressure (115.6^0 C) for 20 minutes. Never use soaps and detergents it affects sperm viability. For Artificial insemination in swine clean the sow/gilt's vulva with clean water and wiped with clean tissue paper. Different sites are recommended by different authors as oviducts (Johnson and Welch, 1999), utero-tubal junction (Kruger, 2000 and Kruger and Rath, 2000) distal parts of the uterus (Wolken *et al*., 2002). Many antioxidants are used for the for improvement of the quality of frozen / thawed semen like ascorbic acid (Spallanzani, 1979 and Bathgate *et al*., 2008), butylated hydroxytoluene (Bailey *et al*., 2000), Reduced glutathione (Tada *et al*., 1990), 4-Hydroxy-2, 2,6,6-tetramethylpeperidine (Tada *et al.,* 1990), Superoxide

Table 1 : Standard qualities of breeding boar semen

Sr. No.	Characteristics	Standard
1.	Colour	Milky or creamy white
2.	Sperm concentration	270-280 million/ ml
3.	Individual motility	70%
4.	Volume	200-500 ml.
5.	Mass motility	40-60%
6.	Motile sperm	60%

Table 2 : Examples of some diluters for boar semen (Banerjee, 2008)

Sr. No.	Dilutors composition- I	quantity	Sr. No.	Dilutor composition-II	quantity
1.	Glucose -D	120.0 g.	1.	Glucose -D	120.0 g
2.	Ethylenediamino acetate	7.4 g	2.	EDTA	7.4 g.
3.	NAOH (Basic solution 4%)	16.0 g	3.	Sodium bicarbonate	2.4 g.
4.	Sodium citrate 35.5%	20.0 ml	4.	Sodium citrate	7.5 g.
5.	Penicillin	1000,000 I.U.	5.	Penicillin	1000,000 I.U.
6.	Streptomycin	0.5 g.	6.	Streptomycin	1.0 g.
7.	Glass distilled water	2000 ml	7.	Glass distilled water	2000 ml

dismutase (Aitkin *et al*., 1989). Different methods of dilutions are used for pig semen dilution. High level dilution causes loss of fertilising ability (Mann, 1964) and damage to the of sperm membranes (Garner *et al*., 2001). The cooling rate for freezing boar spermatozoa should be 30°C/min (Devireddy *et al*., 2004).

Future sperm technologies :

Artificial insemination of swine is widely practiced and is very useful tool to introduce superior gene into sow herds with minimal risk for disease transmission. Now many advance technologies are important for Artificial insemination in swine like Intra-oviductal insemination of a sow by laparoscop. These technologies are the emergent sex-sorted spermatozoa and those so-called future sperm technologies and encapsulated spermatozoa or freeze-dried spermatozoa are used.The success of Artificial insemination is largely determined by the semen quality and the insemination procedure. Use new equipment for every insemination .Be patient during the all procedure during insemination.

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LITERATURE CITED.....

Aitken, R.J., Clarkson, J.S. and Fishel, S. (1989). Generation of reactive oxygen species, lipid peroxidation and human sperm function. *Biol. Reprod.*, **41** : 183–197.

Almlid, T. and Hofmo, P.O. (1996). A brief review of frozen semen application under Norwegian AI service conditions. *Reprod. Dom. Anim*., **31**: 169–173.

Bailey, J.L., Bilodeau, J.F. and Cormier, N. (2000). Semen cryopreservation in domestic animals: a damaging and capacitating phenomenon. *J Androl*, **21**:1–7.

Banerjee, G.C. (2008). *Artificial insemination.* A textbook of animal husbandy VIII Ed., Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 294-338pp.

Bathgate, R. (2008). Functional integrity of sex-sorted, frozen-thawed boar sperm and its potential for artificial insemination. *Theriogenology,* **70**: 1234–1241.

Bathgate, R., Eriksson, B.M., Thomson, P.C., Maxwell, W.M. and Evans, G. (2008). Field fertility of frozen–thawed boar sperm at low doses using non-surgical, deep uterine insemination. *Anim. Reprod. Sci.*, **103** : 323–335.

Crabo, B. and Einarsson, S. (1971). Fertility in deep frozen boar spermatozoa. Acta. *Vet. Scand*., **12**:125–129.

Devireddy, R.V., Fahrig, B., Godke, R.A. and Leibo, S.P. (2004). Subzero water transport characteristics of boar spermatozoa confirm observed optimal cooling rates. *Mol. Reprod. Dev.*, **67** : 446–457.

Garner, D.L., Thomas, C.A., Gravance, C.G., Marshall, C.E., De Jarnette J.M. and Allen, C.H. (2001).Seminal plasma addition attenuates the dilution effect in bovine sperm. *Theriogenology*, **56** : 31–40.

Grobfeld, R., Sieg, B., Struckmann, C., Frenzel, A., Maxwell, W.M.C.and Rath, D. (2008). New aspects of boar semen freezing strategies. *Theriogenology*, **70**: 1225–1233.

Harayama, H., Nanjo, I.K. and Kato, S. (1991). Testicular development in chinese meishan boars. *Theriogenology*, **36** : 637–643.

Ito, H., Kudo, A. and Niwa, T. (1944). Studies on the normal oestrus in swine. *Res. Bull. Zootech. Exp. Stat.*, **49**: 1–51.

Janice, L., Bailey, Lessard C., Jacques, J., Christelle, B. Zeng, W. Hannah, L. and Homer, G. (2008). Cryopreservation of boar semen and its future importance to the industry. *Theriogenology,* **70**: 1251–1259.

Johnson, L.A. andWelch, G.R. (1999). Sex preselection: high-speed flow cytometric sorting of X and Y sperm for maximum efficiency. *Theriogenology,* **52**:1323–1341.

Kruger, C. (2000). Untersuchungen zur intrauterinen Besamung mit reduzierter Spermienzahl bei Jungsauen und Altsauen. Thesis, Hannover: Tiera¨rztl Hochsch.

Kruger, C. and Rath, D. (2000). Intrauterine insemination in sows with reduced sperm number. *Reprod Fertil. Dev.*, **12**:113–117.

Kumaresan, A., Bujarbaruah, K.M., Karunakaran, M., Das, Anubrata and Bardoloi, R.K. (2008). Assessment of early sexual maturity in nondescript local pigs of northeast India: Testicular development, spermiogram and *in vivo* pregnancy. *Livestock Sci.*, **116**: 342–347.

Mann, T. (1964). The biochemistry of semen and of the male reproductive tract. Methuen and Co, LONDON, UNITED KINGDOM.

Milovanov, V.K., Baranov, F.A., Zhiltsova, L.S. and Oivadis, R.N. (1974). Methods of freezing boar semen. *Zhivotnovodstvo*, **3**: 66–71.

Park, H.K., Kim, S.H., Kim, K.J. and Choi, K.M. (1977). Studies on the frozen boar semen. 1. Studies on the development of duluents for freezing of boar semen. *Kor. J. Anim. Sci.*, **19**: 260–266.

Perry, E. J. (1968). The artificial insemination of farm animals. 4th Ed. Rutgers University Press, NEW BRUNSWICK, NJ.

Polge, C., Salamon, S. and Wilmut, I. (1970). Fertilizing capacity of frozen semen following surgical insemination. *Vet. Rec*., **87**: 424–428.

Salamon, S. and Visser, D. (1973). Fertility test of frozen boar spermatozoa. *Aust. J. Biol. Sci*., **26**: 291–293.

Spallanzani, L. (1979). Opuscoli di fisca animale e vegetabile. Obuscolo II. Observazioni e esperenze intorno ai vermicelli spermatici dell' homo e degli animali. (Observations upon the spermatozoa of humans and animals). Modena Cited by Watson PF; 1979.

Tada, N., Sato, M., Yamanoi, J., Mizorogi, T., Kasai, K. and Ogawa, S. (1990). Cryopreservation of mouse spermatozoa in the presence of raffinose and glycerol. *J. Reprod. Fertil*., **89** : 511–516.

Watson, P.F. (1995). Recent developments and concepts in the cryopreservation of spermatozoa and the assessment of their post-thawing function. *Reprod. Fertil. Dev.*, **7**: 871–891.

Weitze, K.F. (2000). Update on the worldwide application of swine AI. In: Boar Semen Preservation IV. Beltsville, MD, USA. 141–145 pp.

Westendorf, P., Richter, L. and Treu, H. (1975). Zur T von Ebersperma Labor-und Besamung se rgebnisse mit dem H lsenberger Pailletten-Verfahren. *Dstch. Tier¨artzl. Wschr*., **82** : 261–267.

Wolken, A., Rath, D, Bortolozzo, R., Wentz, I. and Marquetti, A. (2002). Sows can successfully be inseminated non-surgically into the distal uterine horn with highly reduced number of sperm cells. *Theriogenology*, **57** : 392.

■WEBLIOGRAPHY.....

BAHS (Basic Animal Husbandry Statistics) (2012). Department of animal husbandry, dairying and fisheries, ministry of agriculture, Government of India. April, 2012. *http://www.dahd.nic.in.*